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Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

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AUG 27 1997

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

In the Matter of)
)
Amendment of parts 2.106 and 25.202) RM No. 9147
of the Commission's Rules to Permit)
Operation of NGSO FSS Systems)
Co-Frequency with GSO and Terrestrial)
Systems in the 10.7-12.7 GHz,)
12.75-13.25 GHz, 13.75-14.5 GHz, and)
17.3-17.8 GHz Bands, and to Establish)
Technical Rules Governing NGSO FSS)
Operations in these Bands)

OPPOSITION OF DIRECTV, INC.

DIRECTV, Inc. ("DIRECTV")¹ hereby opposes the above-captioned petition ("Petition") of SkyBridge L.L.C. ("SkyBridge") to the extent that SkyBridge proposes that the Commission allocate for use by non-geostationary orbit ("NGSO") Fixed-Satellite Service ("FSS") systems frequency bands that presently are used by DIRECTV and other providers in the direct broadcast satellite ("DBS") service, known internationally as the broadcasting satellite service ("BSS").

I. DIRECTV'S INTEREST IN THIS PROCEEDING

DIRECTV is the United States' leading provider of DBS service. DIRECTV has invested more than \$750 million in its DBS system, and today provides DBS service to more than 2.7 million subscribers nationwide. Using three high-powered DBS satellites collocated at

¹ DIRECTV is a wholly-owned subsidiary of DIRECTV Enterprises, Inc., which is a DBS licensee and a majority-owned subsidiary of HE Holdings, Inc., a Delaware corporation.

the 101° W.L. orbital position, DIRECTV offers approximately 175 channels of digitally-delivered entertainment, educational, and informational programming directly to homes and businesses equipped with the DSS[®] receiving system, which features satellite dish antennas only 18 inches in diameter. DIRECTV uses the 12.2-12.7 GHz (downlink) and 17.3-17.8 GHz (uplink) bands for its DBS operations, which are allocated internationally in Region 2 (the Americas) for this purpose. SkyBridge proposes to use these same bands for its NGSO/FSS operations.²

II. NGSO OPERATIONS SHOULD NOT BE PERMITTED IN THE 12.2-12.7 GHz OR THE 17.3-17.8 GHz FREQUENCY BANDS

As a threshold matter, SkyBridge's rulemaking request either is inconsistent with, or would require changes to, existing ITU and domestic spectrum allocations to accommodate NGSO operations. Resolution 506 to the ITU Radio Regulations expressly resolves that "administrations shall ensure that their space stations operating in the 12 GHz frequency bands are operated *in the geostationary-satellite orbit and no other*."³ SkyBridge thus is not presently permitted to operate NGSO system downlinks in the 12 GHz band. In addition, SkyBridge is incorrect that the 17.3-17.8 GHz band is "allocated internationally for FSS (Earth-to-space), but is not so allocated in the U.S. Table (and is not assigned to FSS in Part 25)."⁴ The 17.3-17.8

² Petition at 8.

³ ITU Resolution No. 506 (Rev. Orb-88). SkyBridge admits that the Resolution 506 "also precludes NGSO operation." Petition at 9 n. 14.

⁴ *Id.* at 13.

GHz in fact has been allocated on a primary or co-primary basis domestically by the FCC for FSS feeder links to DBS systems, such as DIRECTV's system.⁵

To the extent that SkyBridge's proposal will require additional U.S. Government action at the ITU to harmonize its proposal with existing international allocations, or in the alternative, will require the Commission to adopt allocations that are inconsistent with international allocations, there is no cause for the Commission to do so. As discussed below, the risks posed by SkyBridge's proposed NGSO operations in terms of system disruption and growth constraints with respect to existing U.S. DBS services simply are too great for SkyBridge's rulemaking proposals to be initiated by the Commission, at least with respect to the DBS bands.

A. SkyBridge's NGSO Proposal Threatens To "Freeze" DBS Technology And Stifle The Technological Growth Of DBS Systems

There are good reasons why NGSO/FSS systems should not be injected into bands that today are heavily populated by GSO systems, including DBS systems such as DIRECTV's. While sharing between GSO and NGSO operations may be possible under certain circumstances (*e.g.*, where both types of systems are in the very early stages of development, can be designed to accommodate each other, and the frequency band in question is only lightly used), the Commission should proceed with extreme caution with respect to bands that are heavily populated with operational satellite systems. In DIRECTV's case, for example, the flexibility that DIRECTV may have had ten years ago to accommodate NGSO operations simply does not exist today.

⁵ 47 C.F.R. § 2.106, at 423, 482 n. US271, 489 n. NG 140.

In this regard, even if SkyBridge's claims of non-interference with GSO operations, including DBS operations, were accepted at face value (which they should not be, as explained below), SkyBridge's proposed system parameters and interference criteria for its NGSO operations would pose both operational and developmental constraints on the ability of DBS systems to continue to innovate and expand DBS equipment and service options.

For example, DIRECTV shows below that even under current conditions, SkyBridge's proposed equivalent power flux density limits result in interference levels for DIRECTV subscriber terminals that are not sufficiently below the DIRECTV system noise floor, and pose a significant risk of harmful interference with DIRECTV's existing, mass-marketed consumer service. And to the extent that DIRECTV may desire in the future to provide service to subscribers utilizing even smaller dish antennas (*e.g.*, move from 45 cm to 30 cm antennas) that are more sensitive to interference from non-DBS sources, the situation will be even worse.

Similarly, the NGSO system parameters proposed by SkyBridge, and the restrictions that will be necessary to afford SkyBridge interference protection, have the potential to greatly limit the ability of DIRECTV and the DBS community at large to facilitate the continued evolution of what are still relatively new DBS services. DBS service was first initiated in the United States by DIRECTV only three years ago in 1994, and U.S. DBS providers continue rapidly to adapt their systems to the still-burgeoning, tremendous marketplace demand for upgraded technology and new and innovative BSS services. One innovation that DIRECTV is exploring, for example, is the operation of its DBS spacecraft at higher EIRP levels. Such operation technically is possible, and would permit DBS operators to reduce customer outage time, accommodate more bandwidth-efficient modulation and coding schemes, or support the use

of smaller subscriber antennas. However, protecting the NGSO operations that SkyBridge proposes likely would effectively preclude such higher EIRP level operation.

The Commission in at least one instance has recognized the need for a segmented approach to allow the co-existence of GSO and NGSO systems. In the 28 GHz proceeding, the Commission guaranteed Teledesic exclusive use of 500 MHz of 28 GHz frequency, noting that until certain ITU studies were completed, “we cannot conclude that co-frequency sharing is possible between GSO/FSS systems and NGSO/FSS systems and therefore a separate band designation is warranted.”⁶

The same rationale applies here with even more force with respect to DBS systems. BSS/DBS service in the United States has been one of the Commission’s greatest successes in nurturing a major technology to fruition through a flexible regulatory approach, and DBS already has provided the public with enormous public interest benefits in a very short span of time -- benefits that include the provision of vigorous competition with monopoly cable television operators. These benefits should not be jeopardized by the untoward introduction of NGSO systems into BSS frequency bands that are actively used by GSO satellite systems.

III. SKYBRIDGE’S PROPOSAL THREATENS A GRAVE DISRUPTION OF EXISTING DBS SERVICE

As set forth above, SkyBridge’s suggestion that its proposed NGSO operations will impose no operational or developmental constraints on GSO DBS operators is untrue.⁷

⁶ 28 GHz Rulemaking, *First Report and Order and Fourth Notice of Proposed Rulemaking*, 11 FCC Rcd 19005, 19030, ¶ 59 (1996).

⁷ Petition at ii.

SkyBridge's other claim -- that NGSO FSS systems operating "in the subject bands will cause no noticeable degradation to the quality of service or availability of GSO" communication links⁸ -- is similarly mistaken. At bottom, the fundamental flaw in SkyBridge's analysis is that SkyBridge's calculations appear to be based on BSS system parameters described in Appendix 30 of the ITU Radio Regulations, and to ignore the real-world implementation of the DIRECTV and other U.S. DBS systems.

In the attached Table 1, DIRECTV has provided an analysis of SkyBridge's recommended equivalent power flux density ("epfd") limits relative to the noise floor of DIRECTV subscriber terminals in the 12 GHz band. The limit that SkyBridge has proposed, when converted to an equivalent interference level at a DIRECTV subscriber terminal, is only approximately 6 dB below the DIRECTV subscriber terminal noise floor. This level of interference is very significant in the context of the DIRECTV system.

Within the satellite communications industry, it is generally accepted that for a potential interfering system to be considered to cause "no noticeable degradation," the interference level must be 12 dB or more below the noise floor of the system that must bear the interference (the "interferee"). By this measure, DIRECTV's analysis shows that the epfd limit that SkyBridge has proposed does not remotely afford adequate protection to the DIRECTV system.⁹

⁸ *Id.*

⁹ SkyBridge has raised certain concerns with respect to DIRECTV's rulemaking proposal for the Commission to permit expansion BSS reverse band operations at 17.3-17.8 GHz. *See* Comments of SkyBridge L.L.C., RM 9118 (July 31, 1997). The Commission should

To further illustrate this point, in the presence of an interference level that is only approximately 6 dB below the system noise floor, the system margin of the interferee (DIRECTV) is reduced by more than 1 dB. If more than one interfering system is present at this interference level (*i.e.*, SkyBridge and additional NGSO systems), the system margin of the interferee is reduced even more significantly. Such degradations to the system margin of the DIRECTV system simply are unacceptable, and would increase significantly the amount of rain outage experienced by DIRECTV customers in many areas of the United States. Although it is critical in the context of this proceeding to consider the interference potential created by the operation of multiple NGSO systems in the DBS bands, SkyBridge does not even attempt to address this issue.

Apart from the demonstrable interference problems with the SkyBridge proposal, there are other factors that call into question the integrity of SkyBridge's analysis with respect to DBS systems, and the technical criteria that SkyBridge has presented for evaluating the impact of NGSO proposals on existing GSO systems are incomplete. For example, a reference to the GSO receive antenna parameters to be used is noticeably absent from the definition of epfd limits for BSS bands set forth in the Petition.¹⁰ It is apparent from the formula that SkyBridge has defined for calculating the epfd that the assumed GSO receive antenna pattern is a critical component. And to the extent that SkyBridge used in the calculation of epfd a reference antenna pattern associated with an antenna that is larger than the actual antennas of a GSO system, that

not consider SkyBridge's claims on that subject when its assertions regarding the effect of proposed NGSO operations on existing DBS/BSS operations already are fatally defective.

¹⁰ *Id.* at 18.

calculation would *grossly understate* the interference impact of an NGSO system on the GSO system.¹¹

That is precisely what SkyBridge appears to have done, at least with respect to DBS systems. While a reference to the GSO receive antenna parameters in the SkyBridge Petition is clearly stated for FSS bands, a similar reference is absent from the definition of epfd limits for BSS bands.¹² Neither is there a clear reference to the BSS receive antenna pattern that SkyBridge used in the interference calculations presented in the SkyBridge system application.¹³ Nevertheless, the application does make reference to the peak gain and 3 dB bandwidth that SkyBridge assumed for the BSS receive antenna, as follows:

$$G_{\max} = 40.2 \text{ dBi}$$

and

$$\phi_0 = 1.7^\circ \text{ (3 dB beamwidth).}^{14}$$

These parameters correspond to those of a *1-meter receive antenna*.

While it may be a reasonable assumption to use GSO antenna receive parameters corresponding to a 1 meter receive antenna for some GSO systems, SkyBridge cannot plausibly

¹¹ This is the case because, all else being equal, a larger antenna will have a narrower main beam and smaller sidelobes than a smaller antenna. Therefore, the larger antenna would gather less energy from sources at off angles from its main beam and be less susceptible to off-axis interference.

¹² Compare Petition at 18 with Petition at 17.

¹³ See SkyBridge Application, File No. 48-SAT-P/LA-97, *amended* July 3, 1997.

¹⁴ *Id.* at B-25.

use this assumption to claim, as it does, that its proposed system will cause “no noticeable degradation” to existing GSO *BSS* systems. The DIRECTV system has been in operation for more than three years, and it is well known that DIRECTV subscriber antennas are 45 cm -- *not 1-meter as SkyBridge has assumed*. The use of proper assumptions dramatically affects -- for the worse -- SkyBridge’s analysis and conclusion that GSO licensees are “fully protected from interference.”¹⁵

Finally, and in any event, there certainly is cause to question SkyBridge’s general claim that its satellites truly will be capable of the non-interference described in the Petition. In essence, the non-interference aspect of SkyBridge’s system depends on the ability of its satellites to “shut off” -- to cease transmitting -- in a so-called “non-operating zone” that extends at least $\pm 10^\circ$ from the GSO arc as seen by any GSO earth station located within a 350-km (220-mile) radius cell (a “Gateway Cell”) surrounding each SkyBridge user terminal.¹⁶ SkyBridge claims that as a “Satellite pointing a spot-beam on a particular Gateway Cell approaches the non-operating zone for that Cell, User Terminal and gateway traffic will be handed over automatically by commands from the relevant gateway earth station to a spot-beam on another Satellite located outside of the non-operating zone. The first Satellite cannot begin transmitting again until it has exited the non-operating zone.”¹⁷

SkyBridge’s “non-operating zone” approach is theoretically possible, assuming the validity of all of its other system parameters, but even in a best case is utterly untested. And

¹⁵ Petition at 3.

¹⁶ *Id.* at 6, 10.

¹⁷ *Id.* at 10.

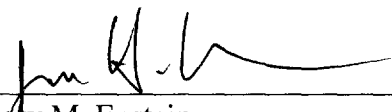
SkyBridge literally asks the Commission to allow SkyBridge to test its approach at the expense of DIRECTV's growing customer base of more than 2.7 million subscribers. If SkyBridge's approach does not work, existing DBS services will be needlessly endangered and vulnerable to severe service disruption. Subjecting DBS operators and subscribers to that risk is not in the public interest.

IV. CONCLUSION

DIRECTV is not opposed in concept to SkyBridge's proposal to open frequency bands for use by NGSO/FSS systems. However, given the risk of disruption to existing businesses discussed above, SkyBridge's proposed NGSO operations should not be permitted in bands that overlap with existing DBS operations. To the extent that SkyBridge's request applies to DBS bands, DIRECTV urges that the Petition be denied.

Respectfully submitted,

DIRECTV, INC.

By: 

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Table 1 :**Analysis of SkyBridge Recommended Equivalent Power Flux Density Limits
Relative to the Noise Floor of DIRECTV Subscriber Terminals in the 12 GHz Band**

Parameter	Units		Notes
DIRECTV subscriber terminal noise floor den	dBW/Hz	-209.1	
Acceptable Io/No value	dB	-12.0	
Acceptable Interference Level at DIRECTV r	dBW/Hz	-221.1	
SkyBridge Proposed Equivalent Power Flux	dBW/m^2	-131.0	
Density Limit (27 MHz ref. BW)			
Normalize to 27 MHz ref. BW to 1 Hz BW	dB(1/Hz)	-74.3	
Isotropic Effective Area (@ 12.5 GHz)	dB m^2	-43.4	
Peak gain of DIRECTV subscriber terminal	dBi	34.4	
Equivalent Interference Level	dBW/Hz	-214.3	
Interference Level Margin	dB	-6.8	

**NOTES: (1) Interface level is only 5.2 dB
(12dB - 6.8dB) below DIRECTV
subscriber terminal noise floor.**

DECLARATION OF PAUL R. ANDERSON

I, Paul R. Anderson, hereby declare as follows:

1. I am Director, Communications Systems for DIRECTV Enterprises, Inc. I am an engineer by training and am familiar with the technical and interference characteristics of DIRECTV's Direct Broadcast Satellite system, the requirements of Part 25 and Part 100 of the Commission's rules, and the interference and technical issues referenced in the foregoing Reply and Exhibits attached thereto.
2. I have reviewed the foregoing filing from a technical perspective, and the information found therein is true and accurate to the best of my knowledge, information and belief.

A handwritten signature in cursive script, reading "Paul Anderson", written over a horizontal line.

Paul R. Anderson
Director, Communications Systems
DIRECTV Enterprises, Inc.

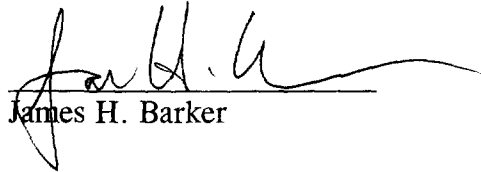
August __, 1997

Certificate of Service

I, James H. Barker, on behalf of DIRECTV Enterprises, Inc., hereby certify that on August 27, 1997, a copy of the foregoing was hand delivered to:

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